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Drunkenness is an inherited disease. A celebrated physician makes an estimate that one-fourth of the cases of insanity are inherited. A race of scholars beget a race of learned men, men with brains capable of receiving much knowledge. Says Oliver Wendell Holmes in one of his greatest novels: "There are races of scholars among us, in which aptitude for learning is congenital and hereditary. Their names are always on some catalogue or other. They break out every generation or two in some learned labor, which calls them up after they seem to have died out. At last some newer name takes their place it may be; but you inquire a little and find it is the blood of the Edwardses, or the Chaunceys, or the Ellerys, or some of the old historic scholars disguised under the altered name of some female descendant."

Of course, there are individuals and families continually working their way up into these intellectual classes, and their posterity will rank with them. But many of us have the way already paved for us in inherited aptitude and brain-power.

Often acquired traits are transmitted until they become a distinguishing characteristic of the race or family, a part of them as it were. Sometimes certain unions, "felicitous crosses," produce an improved strain of blood and a prodigy is born. A child adopted and far removed from its family usually shows forth the disposition of its own people. Occasionally such a one will escape. A generation or two may be skipped, but, sooner or later, the old hereditary traits reappear, breaking out in the blood of the race, no matter what the outer influences may be. Rev. Oscar C. McCulloch, in an address before the National Conference of Charities, stated his having traced a certain family back for the greater part of a century, until the individuals found belonging to it numbered over five thousand, all but one of whom were either vagabonds or criminals. But one of the entire number lived to be an honorable man. Says this reverend gentleman, as quoted by Edward S. Morse in a late number of the *Popular Science Monthly*: "Efforts have been made again and again to lift them, but they sink back. They are a decaying stock; they cannot longer live self dependent. The children reappear with the old basket. The girl begins the life of prostitution, and is soon seen with her illegitimate child."

The entire populace of portions of our great cities is composed of an element such as this. Decency cannot exist within the borders of these slums. Truth cannot survive the diabolic cunning of the place. Missionaries and sanitary officers sent to aid this people are often murdered. "This class," says O. B. Fowler, "are an enormous expense to the State, a constant menace to society, a reality whose shadow is at once colossal and portentous." Millions of them every year start out over country as tramps, and return again to these quarters as winter sets in, to live by theft, crime, and beggary. Their increase is alarming. A race of vagabonds beget a race of vagabonds. What shall we do to prevent this increase? How shall we work a reformation? How shall we treat our criminals born, as it were, out of parallel with natural law? Shall such be allowed to beget a race in which their own characteristics are intensified? Shall such be treated as morally responsible for their misdoings? This is the great problem to be solved by our own and future generations.

"It is singular," says Holmes, "that we recognize all bodily defects that unfit a man for military service, and all intellectual ones that limit his range of thought; but always talk at him as if his moral powers were perfect. . . . I suppose," he continues, "that we must punish evil-doers as we extirpate vermin; but I don't know that we have any more right to judge them than we have to judge rats and mice, which are as good as cats and weasels, thought we think it necessary to treat them as criminals."

Truly, "the sins of the parent are visited on the children, even to the third and fourth generation." Truly, our influence is unending; our lives a blessing or a curse to all future time, just as the power and influence of the great past is interwoven within our own organizations.

Ah, yes! but hidden within this visible being is the *real man*, the overcomer, the spirit pure as when it left the Creator to be incarnated in mortal flesh. That let us recognize. Let us know ourselves, our faults and virtues, the chains that bind us, the aids that have been given us; but let us so recognize our own spirit

lives, our real selves; let us so far become individualists that we are masters and not slaves to inherited tendencies. And let us attempt to solve this great problem, here cited, for the good of our fellow-men and the strengthening and bettering of future generations.

A CONSIDERATION OF THE CLAIMS OF CHEMISTRY AS THE BASIS OF MODERN AGRICULTURE.

BY FRANK T. SHUTT, M.A., CHIEF CHEMIST, DOMINION EXPERIMENTAL FARMS, OTTAWA, CANADA.

AGRICULTURE may be considered at once the oldest of all arts and the youngest of the sciences. It has always had for its object the economic production of plants and animals and the materials elaborated by them during their life. This fact gives us a definition for the term agriculture that was as correct centuries ago as it is now.

Until comparatively late years agriculture existed, as far as the farmer was concerned, as an art only. The application of scientific or classified knowledge to the feeding of plants and animals began with the researches of Liebig and Davy in the early part of the present century. Since then an ever-increasing band of scientists — now spread over the civilized world — has been studying this vast subject with gratifying results. Agriculture, properly so called, has now passed beyond the ranks of empiricism and entered the realms of science.

Strictly speaking, agriculture should not be called a science. The problems which it presents call for their solution upon chemistry, botany, zoölogy, geology, and physics. Mechanics are also more or less closely connected with agriculture as an art, and have been of immeasurable value in reducing the cost as well as increasing the yield of field-crops.

It is to chemistry and animal and vegetable physiology, however, that we look for the answers of innumerable questions that are continually arising in the development of those living things which the farmer has to deal with. Indeed, a little reflection will convince us that it is difficult to state an agricultural problem that does not make demands upon chemistry and physiology for its solution.

Chemistry has to do with the composition of all matter, inert and living, and the changes which such is constantly undergoing. The conversion of soil substances and the constituents of the air into vegetable tissues, and the formation from these of animal tissues and products, though not as yet fully understood, are, nevertheless, truly chemical changes. Looked at chemically, we see nature as the work-shop, plants and animals as the chief agencies, man as the director. The material worked with consists of a limited number of elementary substances and their compounds; plants and animals are continually performing with this material the operations of analysis and synthesis.

Physiology treats of the functions of living things and their various organs; it seeks to explain with the aid of chemistry all the phenomena of life. Living matter is made up of cells capable of nutrition and reproduction. As the result of cell development, animal and plant tissues are formed. The changes which take place in these cells, primarily leading to their nutrition, and secondarily to their reproduction, are true chemical transformations. It becomes clear, therefore, that physiology is largely chemistry, and that the latter science in many instances furnishes the foundation and explanation of vital or physiological processes.

Thus we establish the claim that chemistry forms the basis of scientific agriculture.

Leaving with this brief outline of the fundamental importance of chemistry in the abstract to agriculture, let us proceed to examine somewhat more in detail the aid that this science gives to the farmer. To pursue economically and intelligently, modern agriculture in any of its branches requires an application of the principles of chemistry, since every farm operation, whether performed by nature or man, implies, as may be inferred from what has already been said, changes of material which can only be explained by chemistry and its twin-sister science, physiology.

Chemistry affords definite knowledge as to the amounts of the several constituents taken from the soil by field-crops, thus indi-

cating what must be restored if fertility is to be maintained and lucrative yields obtained in the future. Such knowledge is well-nigh indispensable at the present day to the grower of grain, roots, and fruit if he is to compete successfully with his intelligent neighbors. Chemistry can tell us, in a large measure, of the relative fertility of a soil and point out what elements of plant-food may be lacking. It is the science that makes the barren and waste lands fruitful and is the chief agent in making "two blades of grass grow where there was but one before." To stock-raisers and dairy-farmers it lends its aid in showing the requirements of animals, the daily waste of the animal organism. It ascertains the composition and relative feeding-values of cattle-foods. It analyzes animal products, indicating their comparative worth. Chemistry stamps the value upon artificial fertilizers.

In the by-paths of agriculture, too, chemistry is of service. The intelligent investigator in the important subjects of insecticides and fungicides must prosecute his studies by the light of chemistry. And so we might proceed, but space forbids. Let us, however, remember that history emphatically shows that agriculture and agricultural chemistry have progressed with equal strides, and that for the future the indications are that the relationship of these two will be still closer.

If in this short sketch our claim is made good, then we perceive that it is of paramount importance that agricultural chemistry should form part of the education of every boy destined for the farm. Every public school in rural districts should teach it, not merely theoretically, but practically. All the officers of our experiment stations should have a knowledge of its principles, since no department of agriculture is independent of it. They at present are not only investigators but are also the teachers of the adult and practising farmer. How necessary it is then that all their work should be guided by an intimate acquaintance with that science which is not only the foundation of agriculture, but whose laws govern its operations.

THE REAL MOTIONS OF THE FIXED STARS.

BY PROFESSOR A. W. WILLIAMSON, AUGUSTANA COLLEGE, ROCK ISLAND, ILL.

It is very often stated in newspapers, and also stated in a number of text-books on astronomy, that 1830 Groombridge has a greater velocity than the attraction of all known bodies in the universe could give it. We know not how many dead suns may exist, retaining their full power of attraction, though no longer giving light.

We do not, however, need this supposition to account for the velocity of 1830 Groombridge. Granting the laws of gravitation universal, we are able to account for any finite velocity, the attracting bodies possessing any finite degree of brightness, by supposing these bodies sufficiently large and distant.

Imagine a grand central sun just as dense as ours and a quintillion times as bright, in proportion to its surface. Suppose its distance 10^{72} times that of our sun. Suppose its periodic time 10^{54} times that of our earth. Its mass would be $(10^{72})^3 \div (10^{54})^2 = 10^{216} \div 10^{108} = 10^{108}$ times that of our sun. Its radius would be $\sqrt[3]{10^{108}} = 10^{36}$. Its apparent surface would be $(10^{36} \div 10^{38})^2 = (10^{18})^2 = 10^{36}$ times less than our sun. Its brightness would therefore be $10^{-36} \times 1$ quintillion $= 10^{-18}$ or .000000000000000001 part of that of our sun, that is, it would be as much fainter than an ordinary star as the star is fainter than the sun, invisible even by the Lick telescope.

Our system would therefore move in its orbit around this central sun as many times more rapidly than the earth moves in its orbit, as the diameter of the orbit is greater, divided by the number the periodic time is greater, that is $10^{72} \div 10^{54} = 10^{18}$. As our earth moves over eighteen miles in a second, our system must, on this supposition, move over eighteen quintillion miles in a second, or about one hundred trillion times the velocity.

It is difficult to conceive that so great a sun can have any real existence, and still more difficult to imagine we are moving with such velocity. It seems to me, however, not improbable that as the motion of the planets in their orbits is much greater than that

of their satellites, so the motion of the stars around the common centre is far more rapid than that of the planets around our sun. It seems quite likely that all are moving in the same direction, and that the apparent motions of those having a sensible parallax are only the differences of their true motions. The sun may appear to be moving towards Hercules because it is moving in that direction more rapidly than the average of the stars. May it not also be the case that it is really moving in exactly the opposite direction but more slowly than other stars?

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

The Ancient Libyan Alphabet.

PROFESSOR KEANE in *Science*, Sept. 23, having acknowledged that he referred to the wrong book, should have been ingenuous enough to say that, in the book he did refer to, the primary form given of every letter in the Libyan alphabet is rectilinear, or a dot. As he was not, I offer to place the book in the hands of the editor of *Science* for anyone to convince himself that this is the case.

It is a strange misapprehension of the most important point at issue on the part of Professor Keane, to call the form of the letters "of secondary importance." Their disputed origin can be ascertained only by discovering their original forms.

If Professor Keane had further been ingenuous enough to state why Hanoteau likens the writing of the Touaregs to Arab and Hebrew, he could not have ventured the perfectly incorrect inference he fathers on Hanoteau, that it is "Semitic." Hanoteau refers solely to his belief that the Touareg writing is always read from right to left; in which opinion he was wrong, as I have plenty of documents in *tifinar* to show.

I shall say nothing further of Professor Keane's view of the pronunciation and meaning of the word *tifinar* than that every derivation I can find of it by French scholars regards the initial *t* as part of the radical; which would effectually dispose of the fanciful hypothesis that it comes from *Phœnician*.

D. G. BRINTON.

Media, Penn., Sept. 27.

Twins Among the Indians on Puget Sound.

TWINS among the Indians of Puget Sound are very uncommon; but in former times, when any did appear, they had an exceedingly hard time, as the Indians were superstitiously afraid of them. During the past eighteen years, I have known of but one pair among the Twana Indians, and one pair among the Clallams. The Twanas were well taken care of, as the parents had always lived on the reservation, where the Indian agent had previously had a pair; and so they had had an opportunity of seeing the white customs in regard to them. These parents had also been educated in school, and were quite civilized. To all intents and purposes they were white, and so nothing was done about them except that there was some talk about the former customs in regard to them.

But the pair among the Clallams did not fare so well. Their parents were old-fashioned Indians, were surrounded by old-fashioned Indians, were about eighty miles from the reservation, and they had never had a home on it. The home of their parents was in Fort Discovery, but they were at Neah Bay, catching seals, about eighty miles from home at the time the twins were born. Immediately the Neah Bay Indians became afraid of them, and quickly drove them and their parents away, as they were afraid that the twins would scare all the fish away from their waters. Accordingly, the parents returned to Port Discovery on a steamer, though the Indians were quite unwilling to have them go in that way, fearing that they would frighten all the fish away; and earnestly wished them to walk the entire distance, over mountains and through the forests or on the beach, although there was neither beach or road much of the way.